To Preserve Milk (which should be as fresh as possible) there should be added enough hydrogen peroxide to cause it to be completely decomposed by the enzymes of the milk. For this purpose 1.3 per cent, by volume, of a 3 per cent hydrogen peroxide solution is required. The milk is well shaken and kept for 5 hours at 122° to 125° F. in well-closed vessels. Upon cooling, it may keep fresh for about a month and also to retain its natural fresh taste. With this process, if pure milk is used, the ordinary disease germs are killed off soon after milking and the milk sterilized.

Powdered Cork as a Preservative.—Tests have shown that powdered cork is very efficacious for packing and preserving fruits and vegetables. A bed of cork is placed at the bottom of the case, and the fruits or vegetables and the cork are then disposed in alternate layers, with a final one of cork at the top. Care should be taken to fill up the interstices, in order to prevent friction. Fruit may thus be kept fresh a year, provided any unsound parts have been removed preliminarily. When unpacking for sale, it suffices to plunge the fruit into water. Generally speaking, 50 pounds of cork go with 1,000 or 1,200 pounds of fruit. The cork serves as a protection against cold, heat, and humidity. Various fruits, such as grapes, mandarines, tomatoes, and early vegetables, are successfully packed in this way.

Petrifying Wooden Objects.—Take equal parts of Rock Salt or Table Salt, Rock Alum (Commercial Lump Alum), White Vinegar, Chalk and (powdered) Pebbles. (You can substitute for the latter any kind of coarse quartz sand). Mix all together—ebullition will ensue. After it has ceased, throw some wooden objects into the solution and let them soak for five days, at the end of which time they will be transformed into petrifaction.

Note: This formula really will not petrify the wood, but will cover it with a very nice coat of crystals. As the solution evaporates, it leaves the crystals on the wood which appear as the wood dries. Colored effects may be obtained by using some colored salts, such as potassium, chromate or copper sulphate, but these are poisonous if tasted.

PRINTS, RESTORATION OF:
See Engravings.

PUFFINESS UNDER EYES:

1 ounce Glycerine
20 grains Tannin

Apply every night before retiring with a bit of cotton, or a very soft brush.

PUMICE STONE.

While emery is used for polishing tools, polishing sand for stones and glass, ferric oxide for fine glassware, and lime and felt for metals, pumice stone is more frequently employed for polishing softer objects. Natural pumice stone presents but little firmness, and the search has therefore been made to replace the natural product with an artificial one. An artificial stone has been produced by means of sandstone and clay, designed to be used for a variety of purposes. No. 1, hard or soft, with coarse grain, is designed for leather and waterproof garments, and for the industries of felt and wool; No. 2, hard and soft, of average grain, is designed for work in stucco and sculptors' use, and for rubbing down wood before painting; No. 3, soft, with fine grain, is used for polishing wood and tin articles; No. 4, of average hardness, with fine grain, is used for giving to wood a surface previous to polishing with oil; No. 5, hard, with fine grain, is employed for metal work and stones, especially lithographic stones. These artificial products are utilized in the same manner as the volcanic products. For giving a smooth surface to wood, the operation is dry; but for finishing, the product is diluted with oil.

PUMICE-STONE SOAP:
See Soaps.

PUNCHES:
See Ice Creams.

PUNCTURE CEMENT:
See Cement.

PURPLE OF CASSIUS:
See Gold.

Putty

(See also Lutes, under Adhesives and Cements.)

Common putty, as used by carpenters, painters, and glaziers, is whiting mixed with linseed oil to the consistency of dough. Plasterers use a fine lime mortar that is called putty. Jewelers use a tin oxide for polishing, called putty powder, or putz powder. (See Putz Powder, under Jewelers' Polishes, under Polishes.)

Acid-Proof Putty.—I.—Melt 1 part of gum elastic with 2 parts of linseed oil and mix with the necessary quantity of white bole by continued kneading to the desired consistency. Hydrochloric acid and nitric acid do not attack this putty, it softens somewhat in the warm and does not dry readily on the surface. The drying and hardening is effected by an admixture of ½ part of litharge or red lead.

II.—A putty which will even resist boiling sulphuric acid is prepared by melting caoutchouc at a moderate heat, then adding 8 per cent of tallow, stirring constantly, whereupon sufficiently slaked lime is added until the whole has the consistency of soft dough. Finally about 20 per cent of red lead is still added, which causes the mass to set immediately and to harden and dry. A solution of caoutchouc in double its weight of linseed oil, added by means of heat and with the like quantity (weight) of pipe clay, gives a plastic mass which likewise resists most acids.

Black Putty.—Mix whiting and antimony sulphide, the latter finely powdered, with soluble glass. This putty, it is claimed, can be polished, after hardening, by means of a burnishing agate.

Durable Putty.—According to the "Gewerbeschau," mix a handful of burnt lime with 4¼ ounces of linseed oil; allow this mixture to boil down to the consistency of common putty, and dry the extensible mass received, in a place not accessible to the rays of the sun. When the putty, which has become very hard through the drying, is to be used, it is warmed. Over the flame it will become soft and pliable, but after having been applied and become cold, it binds the various materials very firmly.

Glaziers' Putty.—I.—For puttying panes or looking glasses into picture frames a mixture prepared as follows is well adapted: Make a solution of gum elastic in benzine, strong enough so that a syrup-like fluid results. If the solution be too thin, wait until the benzine evaporates. Then grind white lead in linseed-oil varnish to a stiff paste and add the gum solution. This putty may be used, besides the above purposes, for the tight puttying-in of window panes into their frames. The putty is applied on the glass lap of the frames and the panes are firmly pressed into it. The glass plates thereby obtain a good, firm support and stick to the wood, as the putty adheres both to the glass and to the wood.

II.—A useful putty for mirrors, etc., is prepared by dissolving gummi elasticum (caoutchouc) in benzol to a syrupy solution, and incorporating this latter with a mixture of white lead and linseed oil to make a stiff pulp. The putty adheres strongly to both glass and wood, and may therefore be applied to the framework of the window, mirror, etc., to be glazed, the glass being then pressed firmly on the cementing layer thus formed.

Hard Putty.—This is used by carriage painters and jewelers. Boil 4 pounds brown umber and 7 pounds linseed oil for 2 hours; stir in 2 ounces beeswax; take from the fire and mix in 5½ pounds chalk and 11 pounds white lead; the mixing must be done very thoroughly.

Painters' Putty and Rough Stuff.—Gradually knead sifted dry chalk (whiting) or else rye flour, powdered white lead, zinc white, or lithopone white with good linseed-oil varnish. The best putty is produced from varnish with plenty of chalk and some zinc white. This mixture can be tinted with earth colors. These oil putties must be well kneaded together and rather compact (like glaziers' putty).

If flour paste is boiled (this is best produced by scalding with hot water, pouring in, gradually, the rye flour which has been previously dissolved in a little cold water and stirring constantly until the proper consistency is attained) and dry sifted chalk and a little varnish are added, a good rough stuff for wood or iron is obtained, which can be rubbed. This may also be produced from glaziers' oil putty by gradually kneading into it flour paste and a little more sifted dry chalk.

To Soften Glaziers' Putty.—I.—Glaziers' putty which has become hard can be softened with the following mixture: Mix carefully equal parts of crude powdered potash and freshly burnt lime and make it into a paste with a little water. This dough, to which about ¼ part of soft soap is still added, is applied on the putty to be softened, but care has to be taken not to cover other paint, as it would be surely destroyed thereby. After a few hours the hardest putty will be softened by this caustic mass and can be removed from glass and wood.

II.—A good way to make the putty soft and plastic enough in a few hours so that it can be taken off like fresh putty, is by the use of kerosene, which entirely dissolves the linseed oil of the putty.

transformed into rosin, and quickly penetrates it.

Substitute for Putty.—A cheap and effective substitute for putty to stop cracks in woodwork is made by soaking newspapers in a paste made by boiling a pound of flour in 3 quarts of water, and adding a teaspoonful of alum. This mixture should be of about the same consistency as putty, and should be forced into the cracks with a blunt knife. It will harden, like papier maché, and when dry may be painted or stained to match the boards, when it will be almost imperceptible.

Waterproof Putties.—I.—Grind powdered white lead or minium (red lead) with thick linseed-oil varnish to a stiff paste. This putty is used extensively for tightening wrought-iron gas pipes, for tightening rivet seams on gas meters, hot-water furnaces, cast-iron flange pipes for hot-water heating, etc. The putty made with minium dries very slowly, but becomes tight even before it is quite hard, and holds very firmly after solidification. Sometimes a little ground gypsum is added to it.

The two following putties are cheaper than the above-mentioned red lead putty: II.—One part white lead, 1 part manganese, one part white pipe clay, prepared with linseed-oil varnish.

III.—Two parts red lead, 5 parts white lead, 4 parts clay, ground in or prepared with linseed-oil varnish.

IV.—Excellent putty, which has been found invaluable where waterproof closing and permanent adhesion are desired, is made from litharge and glycerine. The litharge must be finely pulverized and the glycerine very concentrated, thickly liquid, and clear as water. Both substances are mixed into a viscid, thickly liquid pulp. The pegs of kerosene lamps, for instance, can be fixed in so firmly with this putty that they can only be removed by chiseling it out. For puttying in the glass panes of aquariums it is equally valuable. As it can withstand higher temperatures it may be successfully used for fixing tools, curling irons, forks, etc., in the wooden handles. The thickish putty mass is rubbed into the hole, and the part to be fixed is inserted. As this putty hardens very quickly it cannot be prepared in large quantities, and only enough for immediate use must be compounded in each case.

V.—Five parts of hydraulic lime, 0.3 parts of tar, 0.3 parts of rosin, 1 part of horn water (the decoction resulting from boiling horn in water and decanting the latter). The materials are to be mixed and boiled. After cooling, the putty is ready for use. This is an excellent cement for glass, and may be used also for reservoirs and any vessels for holding water, to cement the cracks; also for many other purposes. It will not give way, and is equally good for glass, wood, and metal.

VI.—This is especially recommended for boiler leaks: Mix well together 6 parts of powdered graphite, 3 parts of slaked lime, 8 parts of heavy spar (barytes), and 8 parts of thick linseed-oil varnish, and apply in the ordinary way to the spots.

PUTTY FOR ATTACHING SIGN-LETTERS TO GLASS:

See Adhesives, under Sign-Letter Cements.

PUTTY, TO REMOVE:

See Cleaning Preparations and Methods.

PUTTY POWDER, TO MAKE:

Melt 1 ounce of tin with an equal weight or 1½ ounces of lead, and then raise the heat so as to render the mixed metal red hot, when the tin will be immediately flung out in the state of putty. It is very hard and is used for polishing glass and Japan work, also to color opaque white enamel.

PYROCATECHIN DEVELOPER:

See Photography.

Pyrotechnics

FIREWORKS.

The chief chemical process is, of course, oxidation. Oxidation may be produced by the atmosphere, but in many cases this is not enough, and then the pyrotechnist must employ his knowledge of chemistry in selecting oxidizing agents.

The chief of these oxidizing agents are chlorates and nitrates, the effect of which is to promote the continuance of combustion when it is once started. They are specially useful, owing to their solid non-hygroscopic nature. Then ingredients are needed to prevent the too speedy action of the oxidizing agents, to regulate the process of combustion, such as calomel, sand, and sulphate of potash. Thirdly, there are the active ingredients that produce the desired effect, prominent among which are substances that in contact with flame impart some special color to it. Brilliancy and brightness are imparted by steel, zinc, and copper

filings. Other substances employed are lampblack with gunpowder, and, for theatre purposes, lycopodium.

Fireworks may be classified under four heads, viz.:

1. Single fireworks.
2. Terrestrial fireworks, which are placed upon the ground and the fire issues direct from the surface.
3. Atmospheric fireworks, which begin their display in the air.
4. Aquatic fireworks, in which oxidation is so intense that they produce a flame under water.

Rockets.—First and foremost among atmospheric fireworks are rockets, made in different sizes, each requiring a slightly different percentage composition. A good formula is

Sulphur	1 part
Carbon, wood	2 parts
Niter	4 parts
Meal powder	1 part

Meal powder is a fine black or brown dust, which acts as a diluent.

Roman Candles.—Roman candles are somewhat after the same principle. An average formula is:

Sulphur	4 parts
Carbon	3 parts
Niter	8 parts

CHILDREN'S SAFE FIREWORKS (SPARKLERS):

Coat 12 inch lengths of No. 18 Iron Wire with a compound consisting of:

Powdered sulphur	1	ounce
Potassium nitrate	5	ounces
Powdered charcoal	1½	ounces
Iron filings	2	ounces
Aluminum powder	¼	ounce

mixed in shellac to a thick creamy consistency. Dip the wires in the mixture and then insert the base end of wires in holes drilled into a board, until the mixture dries. Repeat this process until each wire is covered with a thick coat.

COLORED FIRES.

The compounds should be ignited in a small pill box resting on a plate. All the ingredients must be dried and powdered separately, and then lightly mixed on a sheet of paper. Always bear in mind that sulphur and chlorate of potassium explode violently if rubbed together.

Smokeless Vari-Colored Fire.—First take barytes or strontium, and bring to a glowing heat in a suitable dish, remove from the fire, and add the shellac. The latter (unpowdered) will melt at once, and can then be intimately mixed with the barytes or strontium by means of a spatula. After cooling, pulverize. One may also add about 2½ per cent of powdered magnesium to increase the effect. Take for instance 4 parts of barytes or strontium and 1 part of shellac.

The following salts, if finely powdered and burned in an iron ladle with a little spirits, will communicate to the flame their peculiar colors.

Potassium nitrate or sodium chlorate, yellow.
Potassium chlorate, violet.
Calcium chloride, orange.
Strontium nitrate, red.
Barium nitrate, apple green.
Copper nitrate, emerald green.
Borax, green.
Lithium chloride, purple.

The colored fires are used largely in the production of various theatrical effects.

Blue Fire.—

I.—	Ter-sulphuret of antimony	1 part
	Sulphur	2 parts
	Nitrate of potassium	6 parts
II.—	Sulphur	15 parts
	Potassium sulphate	15 parts
	Ammonio-cupric sulphate	15 parts
	Potassium nitrate	27 parts
	Potassium chlorate	28 parts
III.—	Chlorate of potash	8 parts
	Calomel	4 parts
	Copper sulphate	5 parts
	Shellac	3 parts
IV.—	Ore pigment	2 parts
	Charcoal	3 parts
	Potassium chloride	5 parts
	Sulphur	13 parts
	Potassium nitrate	77 parts
V.—	Potassium chlorate	10 parts
	Copper chlorate	20 parts
	Alcohol	20 parts
	Water	100 parts
VI.—	Copper chlorate	100 parts
	Copper nitrate	50 parts
	Barium chlorate	25 parts
	Potassium chlorate	100 parts
	Alcohol	500 parts
	Water	1,000 parts

Green.—

I.—	Barium chlorate	20 parts
	Alcohol	20 parts
	Water	100 parts
II.—	Barium nitrate	10 parts
	Potassium chlorate	10 parts
	Alcohol	20 parts
	Water	100 parts

III.—Shellac..... 5 parts
Barium nitrate.... 1¼ parts

Pound after cooling, and add

Barium chlorate, 2 to 5 per cent.

Red.—

I.—Shellac..... 5 parts
Strontium nitrate 1 to 1.2 parts

Preparation as in green fire. In damp weather add 2 to 4 per cent of potassium chlorate to the red flame; the latter causes a little more smoke.

II.—Strontium nitrate.. 20 parts
Potassium chlorate 10 parts
Alcohol..... 20 parts
Water..... 100 parts

Yellow.—

I.—Sulphur..... 16 parts
Dried carbonate of soda..... 23 parts
Chlorate of potassium..... 61 parts

II.—Sodium chlorate... 20 parts
Potassium oxalate. 10 parts
Alcohol..... 20 parts
Water..... 100 parts

Violet.—

I.—Strontium chlorate. 15 parts
Copper chlorate... 15 parts
Potassium chlorate 15 parts
Alcohol..... 50 parts
Water..... 100 parts

II.—Potassium chlorate 20 parts
Strontium chlorate. 20 parts
Copper chlorate... 10 parts
Alcohol..... 50 parts
Water..... 100 parts

Lilac.—

Potassium chlorate 20 parts
Copper chlorate... 10 parts
Strontium chloride. 10 parts
Alcohol..... 50 parts
Water..... 100 parts

Mauve.—

Chlorate of potash. 28 parts
Calomel..... 12 parts
Shellac..... 4 parts
Strontium nitrate.. 4 parts
Cupric sulphate... 2 parts
Fat..... 1 part

Purple.—

Copper sulphide... 8 parts
Calomel..... 7 parts
Sulphur..... 2 parts
Chlorate of potash. 16 parts

White.—

I.—Gunpowder..... 15 parts
Sulphur..... 22 parts
Nitrate of potassium 64 parts

II.—Potassium nitrate... 30 parts
Sulphur..... 10 parts
Antimony sulphide (black)..... 5 parts
Flour..... 3 parts
Powdered camphor. 2 parts

III.—Charcoal..... 1 part
Sulphur..... 11 parts
Potassium sulphide. 38 parts

IV.—Stearine,..... 1 part
Barium carbonate.. 1 part
Milk sugar..... 4 parts
Potassium nitrate.... 4 parts
Potassium chlorate. 12 parts

As a general rule, a corresponding quantity of shellac may be taken instead of the sulphur for inside fireworks.

The directions for using these solutions are simply to imbibe bibulous papers in them, then carefully dry and roll tightly into rolls of suitable length, according to the length of time they are to burn.

Fuses.—For fuses or igniting papers, the following is used:

Potassium nitrate... 2 parts
Lead acetate..... 40 parts
Water.....100 parts

Mix and dissolve, and in the solution place unsized paper; raise to nearly a boil and keep at this temperature for 20 minutes. If the paper is to be "slow," it may now be taken out, dried, cut into strips, and rolled. If to be "faster," the heat is to be continued longer, according to the quickness desired. Care must be taken to avoid boiling, which might disintegrate the paper.

In preparing these papers, every precaution against fire should be taken, and their preparation in the shop or house should not be thought of. In making the solutions, etc., where heat is necessary, the water bath should invariably be used.

PYROTECHNIC MAGIC.

[Caution.—When about to place any lighted material in the mouth be sure that the mouth is well coated with saliva, and that you are exhaling *the breath continuously*, with greater or less force, *according to the amount of heat you can bear*.

If the lighted material shows a tendency to burn the mouth, *do not attempt to drag it out quickly*, but simply shut the lips tight, and breathe through the nose, and the fire must go out instantly.

In the Human Gas Trick, where a flame 10 to 15 inches long is blown from the mouth, be careful after lighting the

gas, *to continue to exhale the breath.* When you desire the gas to go out, simply shut the lips tight and hold the breath for a few seconds. In this trick, until the gas is well out, any inhalation is likely to be attended with the most serious results.

The several cautions above given may be examined with a lighted match, first removing, after lighting the match, any brimstone or phosphorus from its end.]

To Fire Paper, etc., by Breathing on it.—This secret seems little known to conjurers. Pay particular attention to the caution concerning phosphorus at the head of this article, and the caution respecting the dangerous nature of the prepared fluid given.

Half fill a half-ounce bottle with carbon disulphide, and drop in 1 or 2 fragments of phosphorus, each the size of a pea, which will quickly dissolve. Shake up the liquid, and pour out a small teaspoonful onto a piece of blotting paper. The carbon disulphide will quickly evaporate, leaving a film of phosphorus on the paper, which will quickly emit fumes and burst into flame. The once-popular term Fenian fire was derived from the supposed use of this liquid by the Fenians for the purpose of setting fire to houses by throwing a bottle down a chimney or through a window, the bottle to break and its contents to speedily set fire to the place.

For the purpose of experiment this liquid should only be prepared in small quantities as above, and any left over should be poured away onto the soil in the open air, so as to obviate the risk of fire. Thin paper may be fired in a similar manner with the acid bulbs and powder already mentioned. The powder should be formed into a paste, laid on the paper, and allowed to dry. Then the acid bulb is pasted over the powder.

Burning Brimstone.—Wrap cotton around two small pieces of brimstone and wet it with gasoline; take between the fingers, squeezing the surplus liquid out, light it with a candle, throw back the head well, and put it on the tongue blazing. Blow fire from mouth, and observe that a freshly blown-out candle may be lighted from the flame, which makes it more effective. After lighting candle chew up brimstone and pretend to swallow.

Blazing Sponge Trick.—Take 2 or 3 small sponges, place them in a ladle; pour just enough oil or gasoline over them to wet them. Be very careful not to have enough oil on them to cause them to drip. Set fire to the sponges and take one of them up with the tongs, and throw the head back and drop the blazing sponge in the mouth, expelling the breath all the time. Now close your mouth quickly; this cuts off the air from the flame and it immediately goes out. Be careful not to drop the sponge on the face or chin. Remove sponge under cover of a handkerchief before placing the second one in the mouth.

Burning Sealing Wax.—Take a stick of common sealing wax in one hand and a candle in the other, melt the wax over the candle, and put on your tongue while blazing. The moisture of the mouth cools it almost instantly. Care should be taken not to get any on the lips, chin, or hands.

Demon Bowls of Fire.—The performer has three 6½-inch brass bowls on a table, and openly pours ordinary clean water (may be drunk) into bowls, until each is about half full. Then by simply passing the hand over bowls they each take fire and produce a flame 12 to 20 inches high.

Each bowl contains about 2 teaspoonfuls of ether, upon which is placed a small piece of the metal potassium, about the size of a pea. If the ether be pure the potassium will not be acted upon. When the water is poured into the bowl the ether and potassium float up, the latter acting vigorously on the water, evolving hydrogen and setting fire thereto, and to the ether as well.

The water may be poured into the bowl and lighted at command. In this case the potassium and ether are kept separated in the bowl, the former in a little cup on one side, and the latter in the body of the bowl. The water is poured in, and on rocking the bowl it is caused to wash into the little cup, the potassium floats up, and the fire is produced.

N. B.—The above tricks are not safe in any but specially made bowls, i. e., bowls with the wide flange round edge to prevent the accidental spilling of any portion of the burning ether.

The Burning Banana.—Place some alcohol in a ladle and set fire to it. Dip a banana in the blazing alcohol and eat it while it is blazing. As soon as it is placed in the mouth the fire goes out.

Sparks from the Finger Tips.—Take a small piece of tin about ½ inch wide and 1½ inches long. Bend this in the shape of a ring. To the center of this piece solder another small piece of tin bent in the shape of a letter U; between the

ends of this U place a small piece of wax tape about ½ inch long. Take a piece of small rubber tubing about 2 feet in length and to one end of this attach a hollow rubber ball, which you must partly fill with iron filings. Place the rubber ball containing the iron filings under the arm and pass the rubber tube down through the sleeve of the coat to the palm of the hand; now place the tin ring upon the middle finger, with the wax taper inside of the hand. Light this taper. By pressing the arm down sharply on the rubber ball, the force of the air will drive some of the iron filings through the rubber tube and out through the flame of the burning taper, when they will ignite and cause a beautiful shower of sparks to appear to rain from the finger tips.

To Take Boiling Lead in the Mouth.—The metal used, while not unlike lead in appearance, is not the ordinary metal, but is really an alloy composed of the following substances:

Bismuth.....	8 parts
Lead.....	5 parts
Tin.....	2 parts

To prepare it, first melt the lead in a crucible, then add the bismuth and finally the tin, and stir well together with a piece of tobacco pipe stem. This "fusible metal" will melt in boiling water, and a teaspoon cast from the alloy will melt if very hot water be poured into it, or if boiling water be stirred with it. If the water be not quite boiling, as is pretty sure to be the case if tea from a teapot is used, in all probability the heat will be insufficient to melt the spoon. But by melting the alloy and adding to it a small quantity of quicksilver a compound will be produced, which, though solid at the ordinary temperature, will melt in water *very much below the boiling point.* Another variety of easily fusible alloy is made by melting together

Bismuth.....	7 to 8 parts
Lead.....	4 parts
Tin.....	2 parts
Cadmium.....	1 to 2 parts

This mixture melts at 158°, that given above at 208° F.

Either one of the several alloys above given will contain considerably less heat than lead, and in consequence be the more suitable for the purposes of a "Fire King."

When a body is melted it is raised to a certain temperature and then gets no hotter, not even if the fire be increased—all the extra heat goes to melt the remainder of the substance.

Second Method.—This is done with a ladle constructed similarly to the tin cup in a previous trick. The lead, genuine in this case, is, apparently, drunk from the ladle, which is then tilted, that it may be seen to be empty. The lead is concealed in the secret interior of the ladle, and a solid piece of lead is in conclusion dropped from the mouth, as congealed metal.

To Eat Burning Coals.—In the first place make a good charcoal fire in the furnace. Just before commencing the act throw in three or four pieces of soft pine. When burnt to a coal one cannot tell the difference between this and charcoal, except by sticking a fork into it. This will not burn in the least, while the genuine charcoal will. You can stick your fork into these coals without any difficulty, but the charcoal is brittle and hard; it breaks before the fork goes into it.

Chain of Fire.—Take a piece of candle wick 8 or 10 inches long, saturated with kerosene oil, squeeze out surplus oil. Take hold of one end with your fire tongs, light by furnace, throw back your head, and lower it into your mouth *while exhaling the breath freely.* When all in, close your lips and remove in handkerchief.

NOTE.—Have a good hold of the end with the tongs, for if it should fall it would probably inflict a serious burn; for this reason also no burning oil must drop from the cotton.

Biting Off Red-Hot Iron.—Take a piece of hoop iron about 2 feet long, place it in a vise and bend it backwards and forwards, about an inch from the end, until it is nearly broken off. Put this in a furnace until it becomes red hot, then take it in your right hand, grasp the broken end in your teeth, being careful not to let it touch your lips or your tongue, make a "face" as though it was terribly hard to bite off, and let the broken end drop from betweer your teeth into a pail of water (which you should always have at hand in case of fire), when the hissing will induce the belief that the portion bitten off is still "red hot"—it may be, for that matter, if the iron be nearly broken off in the first place and if you have good teeth and are not afraid to injure them.

Water Stirred Yellow, Scarlet, and Colorless.—Obtain a glass tube with one end hermetically sealed and drawn into a fine point that will break easily. Into an ale glass put a solution of mercury bi-

chloride (corrosive sublimate, a deadly poison) and into the tube a strong solution of potassium iodide so adjusted in strength that it will redissolve the scarlet precipitate formed by the union of the two liquids. While stirring the solution in the glass the bottom of the tube (apparently a glass rod) is broken and a small portion of its contents allowed to escape, which produces a beautiful scarlet. The balance of the fluid in the tube is retained there by simply keeping the thumb on the open top end. Continue the stirring, allowing the balance of the contents of the tube to escape, and the scarlet fluid again becomes colorless. Before the scarlet appears the liquid is yellow.

To heighten the effect, another ale glass, containing only clean water and a solid glass stirring-rod, may be handed to one of the company, with instructions to do the same as the performer; the result is amusing.

RADIATOR CAPS. HOW TO CEMENT:

A 20 per cent solution of sodium silicate or water glass is mixed with zinc dust and whiting (⅔ zinc dust, ⅓ whiting). This will take about 6 hours to set.

A paste of white lead, red lead and linseed oil may be also used but it takes longer to set.

RADIATOR COMPOUND (Automobiles):

To stop small leaks quickly put the white of two eggs in the radiator while the water is cold.

RASPBERRYADE POWDER:

See Salts, Effervescent.

RASPBERRY SYRUP:

See Essences and Extracts.

Rat Poisons

(See also Turpentine.)

Poisons for rats may be divided into two classes, quick and slow. Potassium cyanide and strychnine belong to the first, and phosphorus and arsenic to the second. Both should be kept away from children, dogs, and cats, and this is best done by putting them in places too narrow for anything larger than a rat to squeeze into. If the poison is too quick, the effect of it is visible to the same rats which saw the cause, and those which have not eaten of the bait will leave it alone. On the other hand, if it is too slow, the poisoned rat may spread it to edible things in the pantry, by vomiting. Slow poisons generally cause the rat to seek water, and when they are used water should not be left about promiscuously.

The substances most useful as rat poisons, and which are without danger to the larger domestic animals, are plaster of Paris and fresh squills. Less dangerous than strychnine and arsenic are the baryta preparations, of which the most valuable is barium carbonate. Like plaster of Paris, this substance, when used for the purpose, must be mixed with sugar and meal, or flour, and as a decoy some strong-smelling cheese should be added. In closed places there should be left vessels containing water easily accessible to the creatures.

One advantage over these substances possessed by the squill is that it is greedily eaten by rats and mice. When it is used, however, the same precaution as to water, noted above, is necessary, a circumstance too frequently forgotten. In preparing the squill for this purpose, by the addition of bacon, or fat meat of any kind, the use of a decoy like cheese is unnecessary, as the fats are sufficiently appetizing to the rodents. It is to be noted that only fresh squills should be used for this purpose, as in keeping the bulb the poisonous principle is destroyed, or, at least, is so modified as to seriously injure its value.

Squill Poisons.—The preparation of the squill as a rat poison can be effected in several different ways. Usually, after the removal of the outer peel, the bulb is cut up into little slices and mixed with milk and flour; these are stirred into a dough or paste, which, with bits of bacon rind, is put into the oven and baked. Another plan is to grate the squill on a grater and mingle the gratings with mashed, boiled, or roasted potato. This method of preparing them necessitates the immediate use of the poison. The following is, however, a stable preparation that keeps well:

I.—Hog's lard.....	500 grams
Acid salicylic....	5 grams
Squill.....	1 bulb
Beef suet.....	50 to 100 grams
Barium carbonate.....	500 grams
Solution of ammonium copper acetate, 20 per cent.....	50 grams

Cut or grate the squill into very small pieces, and fry it in the lard and suet until it has acquired a dark-brown color and

the fats have taken up the characteristic squill odor; then to the mess add the other substances, and stir well together.

II.—Squill, bruised..... 4 ounces
Bacon, chopped fine 6 ounces
Flour or meal, enough.
Water, enough.

Make into a stiff mass, divide into small cakes, and bake.

Phosphorus Poisons.—Next to the squill in value as a poison comes phosphorus in the shape of an electuary, or in pills. For readily preparing the electuary, when needed or ordered, it is a good plan to keep on hand a phosphorated syrup made as follows:

To 200 parts of simple syrup, in a strong flask, add 50 parts of phosphorus and 10 parts of talc powder; place the container in a suitable vessel and surround it with water heated to 120° to 130° F., and let it stand until the phosphorus is melted. Now, cork the flask well, tie down the cork, and agitate until the mixture is completely cold. As a measure of precaution, the flask should be wrapped with a cloth.

To make the poison take 50 parts of rye flour and mix with it 10 parts of powdered sugar. To the mixture add about 40 parts of water and from 30 to 40 parts of the phosphorated syrup, and mix the mass thoroughly.

While it is best to make the phosphorated syrup fresh every time that it is required, a stable syrup can be made as follows:

Heat together very carefully in a water bath 5 parts of phosphorus, 3 parts of sublimed sulphur, and 30 parts of water, until the phosphorus is completely melted and taken up; then add 30 parts of wheat flour and 6 parts of ground mustard seed, and work up, with the addition of warm water from time to time, if necessary, into a stiff paste, finally adding and working in from 1 to 2 parts of oil of anise.

Borax in powder, it may be noticed, is also useful as a preservative of phosphorated paste or the electuary.

Mühsam gives the following formula for an electuary of phosphorus for this purpose:

I.—Phosphorus, granulated..... 1 part
Rye flour..... 30 parts
Simple syrup..... 10 parts
Mustard seed, powdered..... 1 part
Sublimed sulphur... 1 part
Water..... 10 parts
Proceed as indicated above.

Hager's formula for "Phosphorus globules" is as follows:

II.—Phosphorus, amorphous..... 10 parts
Glycerine..... 20 parts
Linseed, powdered 100 parts
Meat extract..... 15 parts
Quark, recently coagulated, quantity sufficient.

Mix, and make a mass, and divide into 200 globules, weighing about 15 grains each. Roll in wheat flour, in which a little powdered sugar has been mixed.

Phosphorus electuary, made as indicated above, may be smeared upon bits of fried bacon, which should be tacked firmly to a bit of board or to the floor. It is essential that either flour or sugar, or both, be strewn over the surface of the phosphorus.

The most convenient in practice, on the whole, are the phosphorus globules, either made after Hager's formula, or, more readily, by adding rye flour and sugar to the electuary and working up to a pill mass, or barium carbonate and plaster may be added.

Arsenical Poisons.—The following are some of the formulas given by Hager for preparing globules, or pills, of arsenic:

I.—Arsenic, white, powdered.....100 parts
Soot from the kitchen..... 5 parts
Oil of anise..... 1 part
Lard, sufficient.
Wheat flour, sufficient.

Make into 400 globules.

II.—Beef suet.....500 parts
Rye flour.....500 parts
Arsenic, white, powdered..... 50 parts
Ultramarine..... 10 parts
Oil of anise..... 1 part

Melt the suet, and add to the flour, mix in the other ingredients, and work up while hot, beating the mass with a roller. Make 1,000 globules.

Strychnine Poisons.—The strychnine preparations are also valuable in the destruction of rats and mice. The first of these in point of usefulness is strychnine-wheat, or strychnine-oats (Strychninweizen or Strychninhafer), in the proportion of 1 part of strychnine to 100 or 150 parts of wheat or oat flour, prepared by dissolving 1 part of strychnine in 40 to 50 parts of hot water, mixing well up with the flour, and drying in the water

bath. Strychnine may also be used on fresh or salted meat, sausage, etc., by insertion of the powder, or the heads of fried fish are opened and the powder strewn on the inside. The latter is an especially deadly method, since the odor of the fish acts as a powerful lure, as also do the bits of bacon or other fats used in frying fish. Strong cheese is also a good vehicle for strychnine, acting as a powerful lure for the rodents.

Strychnine sulph.....	1 drachm
Sugar milk.....	3 drachms
Prussian blue.....	5 grains
Sugar.....	½ ounce
Oat flour.....	½ ounce

Nux Vomica Poison.—

Oatmeal.....	1 pound
Powdered nux vomica	1 ounce
Oil of anise.....	5 drops
Tincture of asafetida.	5 drops

Barium Poison.—

Barium carbonate....	4 ounces
Sugar.....	6 ounces
Oatmeal.....	6 ounces
Oil of anise.....	4 drops
Oil of caraway.....	4 drops

RAZOR PAPER:

See Paper.

RAZOR PASTES:

See also Pastes.

The razor pastes, razor creams, etc., on the market, have for their cutting, or sharpening, agent jewelers' rouge, or rouge and emery. When emery is used it should be ground to an impalpable powder and levigated.

I.—The simplest formula is a mixture in equal parts of rouge and emery powder, rubbed up with spermaceti ointment. Coke is also used as a cutting agent. Suet, prepared lard, in fact, any greasy or soapy substance, will answer for the vehicle.

II.—Melt 1,000 parts of beef tallow and pour 250 parts of oil to it. To this mixture, which is uniformly combined by thorough stirring, add in the same manner 150 parts of washed emery, 100 parts of tin ashes, and 50 parts of iron oxide. The stirring of these ingredients must be continued until the mass is cool, as otherwise they would be unevenly distributed. The leather of the strop should be rubbed with this grease, applying only small quantities at a time. This renders it possible to produce a very uniform coating, since little quantities penetrate the fibers of the leather more easily.

III.—Tin putty (tin ashes)..... 2 parts
Colcothar..... 2 parts
Forged iron scales or filings..... 1 part
Pure levantine honing stone finely powdered..... 7 parts
Beef suet..... 3 parts

All the ingredients with the exception of the suet should be finely powdered. The suet is melted, the ingredients poured in, and the whole thoroughly mixed to form a doughy mass.

IV.—Colcothar..... 1½ parts
Pumice stone..... 1½ parts
Graphite..... 4½ parts
Bloodstone (red hematite)..... 2 parts
Iron filings..... 1 part

These ingredients are finely powdered, washed, and mixed with the following:

Grafting wax.....	2 parts
Soap.....	2 parts
Lard.....	2 parts
Olive oil.....	2 parts

Naturally the fatty ingredients are to be heated before the solid substances are commingled with them.

The side of the blade to be polished should be treated with the following compositions:

a. Tin ashes (tin putty) rubbed down to a fine powder on a honing stone and mixed with axle grease.

b. Washed graphite mingled with olive oil.

REDUCER TO MAKE BUST SMALLER AND FIRMER:

50 grams Lanolin
50 grams Vaseline
20 drops Tincture of Benzoin

Mixed with water in which 10 grams of iodide of potassium has been dissolved.

Refrigeration

The only way to produce and maintain low temperatures is by some form of mechanical refrigeration. All mechanical methods depend upon the compression of a gas or volatile liquid. This may be accomplished by a pump or by heat. The compressed vapor is then cooled by water or a current of air. After cooling it is allowed to expand into a larger chamber. It is the expansion which causes the temperature to fall. The expanded vapor is compressed again and the cycle repeated.

Certain chemicals also produce a low temperature when dissolved in water. Combinations of chemicals have been developed which will cause a very considerable fall.

These combinations are limited in value, because the operation cannot be repeated often enough or rapidly enough to keep the temperature down.

The familiar combination of ice and salt is one which is useful in making ice cream. It is low in cost and very effective.

Other combinations such as those listed below are also effective but they are limited to laboratory use, because this effect is momentary just as with ice and salt. Some of these combinations produce a drop in temperature greater than ice and salt, especially if snow or ice is used instead of water.

Another method of producing low temperatures quickly is to fill a beaker with ether or methyl chloride and to pass a current of air through the liquid. A tube of water placed in the beaker will freeze very quickly.

Carbon dioxide which has been compressed until it becomes solid is now sold by the pound and its cost is reasonable. When allowed to evaporate it produces very low temperatures for a considerable length of time.

REFRIGERANTS.

I.—Potassium nitrate...	2	pounds
Ammonium chloride	2	pounds
Water.....	5	pints
II.—Potassium nitrate...	2½	pounds
Ammonium chloride	2½	pounds
Sodium sulphate....	4	pounds
Water.....	9	pints
III.—Ammonia nitrate...	4	pounds
Water.....	4	pints
IV.—Sodium sulphate....	8	parts
Dilute hydrochloric acid.....	5	parts

A simple chemical refrigerant which is efficient and at the same time low in cost is the following:

Prepare a ten per cent dilution of sulphuric acid in water. Place this in a wooden tub or stone jug and allow to cool. Add a handful of Glauber's salts for each quart of solution. The temperature will drop sharply, and the cooler the solution is to start with the lower the resulting temperature will be.

Under good conditions a test tube of water may be frozen by placing it in the mixture.

Home-Made Refrigerators.—I.—Partly fill with water a shallow granite-ware pan. Place it in an open, shady window where there is a good draught of air. In this put bottles of water, milk, and cream (sealed), wrapped with wet cloths reaching into the water. Put butter in an earthen dish deep enough to prevent water getting in. Over this turn an earthen flower-pot wrapped with a wet cloth reaching into the water. The pan should be fixed every morning and evening. With several of these pans one can keep house very comfortably without ice.

II.—Procure a wire meat-safe—that is, a box covered by wire netting on three sides, with a fly-proof door. On top place a deep pan filled with water. Take a piece of burlap the height of the pan and safe, and of sufficient length to reach around the entire safe. Tack it fast where the door opens and closes. Tuck the upper edge in the water. Place it where there is a draught and where the dripping will do no damage. This constitutes a well-ventilated refrigerator that costs nothing but water to maintain.

III.—Take a store box, any convenient size, and place in this a smaller box, having the bottom and space around the sides packed with sawdust. Have a galvanized iron pan made, the size of the inside box and half as deep, to hold the ice. Have the pan made with a spout 6 inches long to drain off the water as the ice melts. Bore a hole the size of the spout through the double bottom and sawdust packing to admit the spout. Short legs may be nailed on the sides of the box and a vessel set underneath to catch the drippings. Put on a tight board cover. A shelf may be placed in the box above the ice. This box will keep ice for three days.

IV.—Select a large cracker box with a hinged cover. Knock out the bottom and cut windows in each side, leaving a 3-inch frame, over which tack wire gauze. In the coolest part of the cellar dig away the earth to a level depth of 3 inches and fit the box into the space.

Mix plaster of Paris to a consistency of thick cream and pour into the box for a ½-inch thick bottom. Twenty-four hours will harden it sufficiently. Put a hook and catch on the lid. A box of this sort can be cleaned easily, and insects cannot penetrate it.

To Drain a Refrigerator.—I.—Have

a stout tin funnel made, 7 inches in diameter at the top. The tube portion should be at least 8 inches long and of uniform diameter. Bore a hole through the floor directly under the drain-pipe of the refrigerator; insert the funnel, then force a piece of rubber tubing (a tight fit) over the funnel from the cellar side. Pass the tubing through a hole cut in the screen frame of a cellar window, and drain into any convenient place. This avoids the necessity of continually emptying the drain-pan, and prevents the overflow that frequently occurs when it is forgotten.

II.—This simple device saves the inconvenience of having a drip-pan under the refrigerator: If the refrigerator is placed near the outer wall get a piece of rubber hose long enough to reach from the waste pipe to the outside of the wall. Bore a hole through the wall under the refrigerator, where baseboard and floor meet. Attach the hose to the waste-pipe and pass through the hole in the wall. A small trough outside should carry the water away from the house.

ROLLER COMPOSITIONS FOR PRINTERS.

Rollers for transferring ink to types have to possess special properties, which have reference both to the nature of the ink and that of the types to which it is to be transferred. They must be as little liable as possible to changes of temperature. They must be sticky, but only just sticky enough, and must have elasticity enough to exert a uniform pressure over the varying surface with which they meet in the form. Originally, the composition was one of glue and molasses in varying proportions, and the only practical improvement that has been made is the addition of glycerine. This being slightly hygroscopic, helps to keep the roller at the right degree of softness, and being practically unfreezable, it is a great assistance in keeping the rollers from hardening in cold weather.

The recipes given in technical works for printing roller compositions are numerous and very different. All contain glue and molasses, and it is the practice to put a larger proportion of glue in rollers to be used in the summer than in those intended for winter use. The following is a selection of recipes:

I.—Soak 8 pounds of glue in as much water as it will absorb. When there is no visible water, treat the glue till melted, and add 7 pounds of hot molasses.

II.—Glue (summer)....	8 pounds
Glue (winter).....	4 pounds
Molasses.....	1 gallon
III.—Molasses.....	12 pounds
Glue.....	4 pounds
IV.—Molasses.....	24 pounds
Glue.....	16 pounds
Paris white.....	2 pounds
V.—Glue or gelatin....	64 pounds
Water.....	48 pounds
Linseed oil.....	96 pounds
Molasses or sugar.	64 to 96 pounds
Chloride of calcium	3 pounds
Powdered rosin ...	8 pounds

Soak the glue in the water and then liquefy by heat. Then stir in the oil, first heated to 150° F. Then add the molasses and the chloride of calcium, and finally the fused rosin. The latter ingredient is only to be added when very tough rollers are required. This recipe is interesting from the inclusion in it of the hygroscopic salt, chloride of calcium, the object of which is obviously to keep the rollers moist.

ROOFS, HOW TO LAY GALVANIZED.

See Household Formulas.

ROOFS, PREVENTION OF LEAKAGE:

See Household Formulas.

ROOF PAINTS:

See Paint.

ROOM DEODORIZER:

See Household Formulas.

ROPES.

To protect ropes, cordage, and cloths made of flax and hemp against rot, it has been recommended to leave them for 4 days in a solution of copper sulphate, 20 parts by weight to a liter, then allow them to dry, and then, to prevent the copper sulphate being washed away by the water, place in tar or a solution of soap—1 to 10. In the latter case an insoluble copper soap is formed. To secure the same result with twine, the following process has been recommended: Place the string for an hour in a solution of glue, then allow to dry, and place in a solution of tannin. After removal from the tannin, again dry, and soak in oil. The process first described has been shown by experience to be very effective; but to prevent the washing away of the copper sulphate, it is advisable to use the solution of soap in preference to the tar, as articles steeped in the latter substance are apt to become stiff, and consequently brittle. The

treatment with glue and tannin in the second process has the drawback that it tends to make the string too stiff and inflexible, and thus impair its usefulness.

ROPE LUBRICANTS:
See Lubricant.

ROPES, WATERPROOFING:
See Waterproofing.

ROSE CORDIAL:
See Wines and Liquors.

ROSEWOOD:
See Wood.

ROSE POWDERS:
See Cosmetics.

ROSIN, TESTS FOR, IN EXTRACTS:
See Foods.

ROSIN OIL:
See Oil.

ROSIN STICKS:
See Depilatories.

ROT:

Remedies for Dry Rot.—A good remedy for dry rot is petroleum. The sick parts of the wood are painted with it, which causes the fungi to die, turn black, and finally drop off. The best preventive of dry rot is plenty of draught. If the portions are already affected so badly that they must be removed and renewed, the freshly inserted wood is coated with "carbolineum" to prevent a fresh appearance of dry rot. Another remedy is ordinary salt, which is known to have a highly hygroscopic action. It absorbs the moisture of the wood, whereby it is itself dissolved, thus gradually impregnating the planks, etc. In order to combat dry rot with salt, proceed as follows: Throw salt into boiling water until a perfectly saturated solution is obtained. With this repeatedly wash the wood and masonry afflicted with dry rot. Wherever practicable the salt may be sprinkled direct upon the affected place.

ROUGE:
See Cosmetics.

ROUGE FOR BUFF WHEELS.

The rouge employed by machinists, watchmakers, and jewelers, is obtained by directly subjecting crystals of sulphate of iron or copperas to a high heat by which the sulphuric acid is expelled and the oxide of iron remains. Those portions least calcined, when ground, are used for polishing gold and silver. These are of bright crimson color. The darker and more calcined portions are known as "crocus," and are used for polishing brass and steel. Others prefer for the production of rouge the peroxide of iron precipitated by ammonia from a dilute solution of sulphate of iron, which is washed, compressed until dry, then exposed to a low red heat and ground to powder. Of course, there are other substances besides rouge which are employed in polishing, as powdered emery, kieselguhr, carborundum, rotten stone, etc.

ROUGE POWDER:
See Polishes.

ROUGH STUFF:
See Wood.

ROUP CURES:
See Veterinary Formulas.

Rubber

ARTIFICIAL RUBBER.

Austin G. Day tried hundreds of experiments and took out many patents for rubber substitutes. He was in a measure successful, his "Kerite" compound proving of great value and being a result of his seeking for something that would wholly supplant rubber. As far back as 1866 he made public the results of some of his work, giving as formulas for rubber substitutes the following compounds:

I.—Linseed oil	2	pounds
Cottonseed oil	1	pound
Petroleum	2	pounds
Raw turpentine	2	pounds
Sulphur	2	pounds

Boil 2 hours.

II.—Linseed oil	2	pounds
Cottonseed oil	1	pound
Petroleum	1	pound
Raw turpentine	2	pounds
Castor oil	1	pound
Sulphur	2	pounds

Boil ½ hour.

III.—Linseed oil	2	pounds
Cottonseed oil	1	pound
Petroleum	1	pound
Raw turpentine	½	pound
Liquid coal tar	3	pounds
Peanut oil	1	pound
Spirits turpentine	1	pound
Sulphur	4	pounds

Boil 35 minutes.

IV.—Linseed oil	2	pounds
Cottonseed oil	1	pound
Petroleum	2	pounds
Raw turpentine	½	pound
Liquid coal tar	2	pounds

Spirits turpentine	1	pound
Rubber		pound
Sulphur	2	pounds

Boil 1 hour.

In 1871 Mr. Day had brought his experimenting down to the following formula:

V.—Cottonseed oil	14	pounds
Linseed oil	14	pounds
Asphaltum	8	pounds
Coal tar	8	pounds
Sulphur	10	pounds
Camphor	½	pound

In this the tar and asphaltum were first mixed with the cottonseed oil, after which was added the linseed oil and camphor, and, last of all, the sulphur, when the temperature was about 270° F.

A substitute designed to be used in rubber compounding in place, say, of reclaimed rubber, was made as follows:

VI.—Cottonseed oil	27 pounds
Coal tar	30 pounds
Earthy matter	5 pounds

To be mixed and heated to 300° F., and then strained and cooled to 200° F. Then were added 27 pounds linseed oil, the heat raised to 220° F., and 15 to 18 pounds of sulphur added, the heat being continually raised until the mass was sulphurized. When the heat reached 240° F., 1 to 1½ ounces of nitric acid were added, and at 270° to 280° F., from 1 to 3 ounces camphor were added to help the sulphurization. The resultant compound was used on the following basis:

VII.—Para rubber	20 pounds
Litharge	5 pounds
Sulphur	1 pound
Above compound	20 to 40 pounds

Mr. Day did not insist on the compound quoted, but advised that the proportions be varied as widely as the exigencies of the case might demand. Whiting, barytes, infusorial earth, white lead, blacks, in fact almost any of the oxides, carbonates, or earthy materials commonly used in compounding, were used in connection with his substitute, as also were any grades of crude rubber. Among other ingredients that he found of use in making his substitutes were vegetable and animal waxes, together with ozokerite and paraffine. These were only used in small quantities, and always in connection with the linseed and cottonseed oils, and generally asphaltum or coal tar. One of his compounds also called for a quantity of golden sulphuret of antimony, presumably to assist in the sulphurization, and a small amount of tannic acid.

Another line of experimenting that is interesting, and that will yet produce good results, although so far it has not amounted to much, is in the use of cellulose. A very simple formula is of French origin and calls for the treating of cellulose with sulphuric acid, washing, drying, granulating, treating with resinate of soda—which is afterwards precipitated by sulphate of alumina—then drying and molding under pressure. As a matter of fact, the resultant mass would not be mistaken for rubber. An English formula is more like it. This consists of

VIII.—Cellulose	15 pounds
Pitch	25 pounds
Asphalt	20 pounds
Silica	20 pounds
Mastic	5 pounds
Bitumen	5 pounds
Rosin	10 pounds
Coal tar	12 pounds

This makes a thick gummy varnish which is of little use except as for its waterproof qualities. Allen's formula for a cellulose substitute might have a value if it were carried further. It is made up of 100 pounds of rosinous wood pulp treated with animal gelatin, 100 pounds asphalt, and 10 pounds asphalt oil, all heated and molded.

The Greening process, which is English, is more elaborate than Allen's, but seems a bit laborious and costly. This process calls for the treatment of the cellulose by a mixture of sulphuric acid and nitrate of potash, and, after drying, a treatment to a bath of liquid carbonic acid. When dry again, it is mixed in a retort with refined rosin, gum benzoin, castor oil, and methylated alcohol. The distillate from this is dried by redistilling over anhydrous lime.

Another curious line of substitutes is that based upon the use of glue and glycerine. Some of these have uses, while others, that look very attractive, are of no use at all, for the simple reason that they will absorb water almost as readily as a dry sponge. The first of these is more than 30 years old and is said to be of French origin. The formula is:

IX.—Glue	4 pounds
Glycerine	8 ounces
Nutgall	3 ounces
Acetic acid, 1 pound in 5 pounds of water.	

Ten years later this was approached by an English formula in which in place of

the nutgall and acetic acid, chromic and tannic acids were substituted, and a modicum of ground cork was added as a cheapener probably. Some four years later an ingenious Prussian gave out a formula in which to the glue and glycerine and tannic acid were added Marseilles soap and linseed oil. None of the above have ever had a commercial value, the nearest approach being the glue and glycerine compound used as a cover for gas tubing.

The substitutes that have really come into use generally are made either from linseed, cottonseed, or maize oil. Scores of these have been produced and thousands of dollars have been spent by promoters and owners in trying to make these gums do just what crude rubber will. A German formula which was partially successful is

X.—Linseed oil, in solution..... 80 pounds
Lime-hardened rosin, in solution 50 pounds

Add to above

Sulphur..... 8 pounds
Linseed oil..... 42 pounds

Add 20 pounds sulphur and heat to 375° F.

Rubber and Rubber Articles.—As regards the action of coal gas on rubber tubes, it has been observed that it is weakest on ordinary gray rubber which withstands it the longest, and gives off no odor. Red rubber is more readily affected, and the black kind still more so.

To prevent rubber tubes from drying up and becoming brittle, they should be coated with a 3 per cent aqueous solution of carbolic acid, which preserves them. If they have already turned stiff and brittle, they can be rendered soft and pliant again by being placed in ammonia which has been made liquid with double the amount of water.

In France rubber tubes are used as a core for casting pipes from cement and sand. In order to construct a connected pipe conduit in the ground, a groove is dug and a layer of cement mortar spread out. Upon this the rubber tube is laid, which is wrapped up in canvas and inflated. The remaining portion of the channel is then filled up with cement mortar, and as soon as it has set, the air is let out of the rubber hose and the latter is pulled out and used as before.

To cover cloth with rubber, there are chiefly employed for dissolving the rubber, naphtha, alcohol, and benzol. They are mixed with purified solid paraffine, and ground together.

Rubber boots and shoes are rendered waterproof by melting 4 parts of spermaceti and 1 part of rubber on a moderate fire, adding tallow or fat, 10 parts, and lastly 5 parts of copal varnish or amber varnish. This mixture is applied on the shoes with a brush. It should be stated that the rubber used for this purpose must be cut up very small and allowed 4 to 5 hours to dissolve.

To rid rubber articles of unpleasant odor, cover both sides with a layer of animal charcoal and heat to about 140° F.

To prevent gas from escaping through rubber hose, cover it with a mixture prepared as follows: Dissolve 5 parts of gum arabic and 3 parts of molasses in 15 parts of white wine and add, with constant stirring, 6 parts of alcohol in small quantities. Stirring is necessary to prevent the alcohol from precipitating the gum arabic.

Repairing Rubber Goods.—First, clean off all adherent matter, and dry thoroughly. Varnish or lacquer, as for instance on rubber shoes, may be removed with sand or emery paper, or even with a file, in the absence of one of these. The surface thus produced is then rubbed with benzine. A solution of Para rubber in benzine is then painted over the surface around the break or tear, and a strip of natural rubber fitted over it. Then prepare a vulcanizing solution as follows:

Sulphur chloride.... 18 parts
Benzine..... 400 parts
Carbon disulphide.. 300 parts

This is applied to the edges of the joint by means of a pledget of cotton wrapped on the end of a little stick, and press the jointed parts well together.

One may repair rubber bulbs by the following method: Put some pure gum in three times its bulk of benzine, and cork tightly. Let stand several days. Get some rubber in sheet form; it will be better if it is backed with cloth. To make a patch, dampen some little distance around the hole to be mended with benzine. After a moment, scrape with a knife; repeat the process several times till the site to be patched is thoroughly clean. Cut a patch from sheet of rubber a little larger than the hole to be mended, and apply to its surface several coats of the benzine solution. Then apply a good coat of the solution to both patch and about the hole, and press the patch firmly in place. Again apply the solution to make coating over the patch, and allow to dry till it will not stick to the finger. Do not use for several days.

Cracked rubber goods may be suc

cessfully mended in the following manner: Before patching, the cracked surfaces to unite well must be dried, entirely freed from all dirt and dust and greased well, otherwise the surfaces will not combine. In case of a cover, waterproof coat, or rubber boots, etc., take a moderately thick piece of india rubber, suited to size of the object, cut off the edges obliquely with a sharp knife moistened in water, coat the defective places as well as the cut pieces of rubber with oil of turpentine, lay the coated parts together and subject them for 24 hours to a moderate pressure. The mended portions will be just as waterproof as the whole one. Rubber cushions or articles containing air are repaired in a very simple manner, after being cleaned as aforesaid. Then take colophony, dissolve it in alcohol (90 per cent) so that a thick paste forms, smear up the holes, allow all to harden well, and the rubber article, pillow, ball, knee caps, etc., may be used again.

Softening Rubber.—The hardening of gum articles is generally referable to these having been kept for a long time in some warm, dry place, though keeping them in the cold will produce the same effect. Hardness and brittleness, under any reasonable care and conditions, are usually signs of an inferior article of goods. Articles of Para rubber, of good workmanship, usually maintain their elasticity for a very long time. Before attempting to soften hollow rubber ware, such as flasks, water bags, or bottles, etc., they should be well scrubbed with a wire brush (bottle cleaner) and warm water, so as to remove all dirt and dust. This scrubbing should be continued until the wash water comes away clean and bright. For softening, the best agent is dilute water of ammonia, prepared by mixing pharmacopœial ammonia water, 1 part, and water, 2 parts. There should be enough of this to cover the articles, inside and out. Let them remain in the mixture until the ammonia has evaporated. Warm water works better than cold. From 1 to 2 hours will be long enough, as a usual thing. Thick and massive articles such as large rubber tubing, require more energetic treatment, and the journal recommends for the treatment of these that they be filled nearly full with the ammonia mixture, corked at both ends, and coiled up in a kettle, or other vessel, of sufficient size, warm water poured in sufficient to cover the coil completely, and lightly boiled for from 1 to 2 hours. The water lost by evaporation should be replaced from time to time, and the vessel should never be allowed to boil violently. When the proper time has arrived (and this must be learned, it appears, by experience, as the article quoted gives no directions save those translated), remove from the fire, and allow to cool gradually.

Glycerine has been also recommended, and it may be used with advantage in certain cases. The articles must first be cleaned with the brush and warm water, as above detailed. Heat them in water and rub them with a wad of cotton soaked in glycerine, drawing the wad over them, backwards and forwards. This wad should be wrapped with good stout wire, the ends of which are prolonged, to serve as a handle. Where possible the articles should be stricken with the glycerine inside and out, the article being, naturally, held out of the boiling water, sufficiently, at least, to make bare the part being rubbed at the time. Let rest for 24 hours, and repeat this process. With goods kept in stock, that show a tendency to grow brittle, this treatment should be repeated every 6 months or oftener. Never put away tubing, etc., treated in this manner until every particle of moisture has drained off or evaporated.

Another authority, Zeigler, has the following on this subject: Tubing, bands, and other articles of vulcanized caoutchouc that have become brittle and useless, may be restored to usefulness, indeed, to their pristine elasticity, by treating them as follows: First, put them in a hot aqueous solution of tannic acid and tartar emetic. Next, transfer them to a cold aqueous solution of tannic acid and calcium sulphate. Mix the two solutions and heat to about the boiling point, and transfer the articles to the hot solution. This treatment should be maintained from 1 day to 3 or 4, according to the nature and condition of the articles.

To restore rubber stoppers that have become too hard for usefulness, digest them in 5 per cent soda lye for about 10 days at 86° to 104° F., replacing the lye repeatedly. Next, wash the stoppers in water and scrape off the softened outer layer with a knife, until no more can be removed. The stoppers (which have become quite soft and elastic again) are next rinsed in warm water to remove the caustic soda. If it is desired to trim them it should be done with a knife moistened with soap spirit.

Treatment and Utilization of Rubber Scraps.—The scraps, assorted according

to their composition, are first cleaned by boiling to remove the adhering dirt, absorbed and adhering acids, salts, etc., as well as to eliminate the free sulphur. Next, the waste is ground between rollers and reduced to powder in emery grinders with automatic feeding. In many cases the material obtained may be added at once dry to the mixture, but generally it first receives a chemical treatment. This is carried out by boiling in caustic soda solution, or sulphuric or hydrochloric acid respectively, and steaming for about 20 hours with 4 atmospheres pressure.

According to another method, the ground scraps are steamed with soda lye under pressure, washed twice thoroughly for the elimination of the lye, and dried in the vacuum. Subsequently mix between cold rollers with 5 to 10 per cent of benzol or mineral oil and steam for some hours under hydraulic pressure at 4 atmospheres. The product thus obtained is rolled in plates and added to the mixture. The finely ground dry waste must not be stored for a long time in large quantities, as it hardens very easily and takes fire.

Old articles of vulcarized rubber are first "devulcanized" by grinding, boiling with caustic soda, and washing thoroughly. After drying, the scraps are heated to 302° F. with linseed oil in a kettle provided with stirring mechanism which is kept in continual motion. When the rubber has dissolved, a quantity of natural or coal-tar asphalt is added, and as soon as the contents of the kettle have become well mixed, the temperature is raised so high that dense fumes begin to rise and air is forced through the mass until a cooled sample shows the desired consistence. This composition being very tough and flexible, forms an excellent covering for electric cables. It finds many other uses, the proportions of rubber, asphalt, and oil being varied in accordance with the purpose for which it is designed.

Vulcanization.—Besides the Goodyear, Mason, and other patented processes, the process now usually followed in vulcanizing rubber stamps and similar small objects of rubber, is as follows:

Sulphur chloride is dissolved in carbon disulphide in various proportions, according to the degree of hardness the vulcanized object is to receive; the rubber cast is plunged in the solution and left there from 60 to 70 seconds. On removing, it is placed in a box or space warmed to 80° F., and left long enough for the carbon disulphide to evaporate, or about 90 to 100 seconds. It is then washed in a weakly alkaline bath of water, and dried.

Another method (recommended by Gerard) depends upon letting the rubber lie in a solution of potassium *ter* or *penta* sulphide, of 25° Bé., heated to about 280° F. for 3 hours.

Testing Rubber Gloves.—In testing rubber gloves it is best to inflate them with air, and then put them under water. Thus one may discover many small holes in new ones which otherwise would have been impossible to find.

Dissolving Old Rubber.—The material is shredded finely and then heated, under pressure, for several hours, with a strong solution of caustic soda. All cloth, paint, glue, fillers, etc., in the rubber are disintegrated, but the rubber is not affected. The mass is then washed repeatedly with water, to remove all alkali, and the resultant pure rubber may then be formed into sheets.

Rubber Stamps.—Set up the desired name and address in common type, oil the type and place a guard about ½ inch high around the form. Mix plaster of Paris to the proper consistence, pour in and allow it to set. Have the vulcanized rubber all ready, as made in long strips 3 inches wide and ⅛ of an inch thick, cut off the size of the intended stamp, remove the plaster cast from the type, and place both the cast and the rubber in a screw press, applying sufficient heat to thoroughly soften the rubber. Then turn down the screw hard and let it remain until the rubber receives the exact impression of the cast and becomes cold, when it is removed, neatly trimmed with a sharp knife, and cemented to the handle ready for use.

RUBBER CEMENTS:
See Adhesives.

RUBBER GLOVES, SUBSTITUTE FOR:
See Antiseptics.

RUBBER, ITS PROPERTIES AND USES IN WATERPROOFING:
See Waterproofing.

RUBBER VARNISHES:
See Varnishes.

RUBY SETTINGS:
See Watchmakers' Formulas.

RUOLTZ METAL:
See Alloys.

RUM, BAY:
See Bay Rum.

Rust Preventives

(See also Enamels, Glazes, Paints, Varnishes, Waterproofing.)

In spite of the numerous endeavors to protect metal objects from oxidation, a thoroughly satisfactory process has not yet been found, and we still have to resort to coatings and embrocations.

By covering the metals with a pale, colorless linseed-oil varnish, a fat or spirit lacquer, an unfailing protection against oxidation is obtained. This method, though frequently employed, however, is too laborious and expensive to admit of general use, and instead we frequently see employed ordinary or specially composed greases, especially for scythes, straw-knives, and many other bright iron goods. These greases are not suited to retard oxidation, for they are without exception acid-reacting bodies, which absorb oxygen in the air and under the action of light, thus rather assisting oxidation than retarding it. A covering of wax dissolved in oil of turpentine would be more recommendable, because wax is an impervious body, and a firm and rather hard layer remains after evaporation of the oil of turpentine, which excludes the air. If the treatment with the wax salve is carefully attended to no other objection can be urged against this preserving agent than that it is likewise comparatively expensive if used in large quantities. As regards the greases, and treatment with petroleum or vaseline, the easy attrition of these substances is another drawback, which makes a lasting protection impossible.

According to Shedlok, cast-iron articles are treated with acids, then exposed to the action of steam, hot or cold water, and dried. The receptacle is exhausted of air and a solution of pitch, rosin, rubber, or caoutchouc, applied under pressure. Objects prepared in this manner are said to be impervious even to weak acids.

The inoxidizing process of Ward is founded on the simultaneous employment of silicates and heat. The cast iron or wrought iron are coated with a siliceous mass by means of a brush or by immersion. This covering dries quickly, becomes liquid when the articles are exposed to a suitable heat, and soaks into the pores of the metal, forming a dense and uniform coat of dull black color after cooling, which is not changed by long-continued influence of the atmosphere, and which neither scales nor peels from the object. By the admixture of glass coloring matters to the siliceous mass, decorated surfaces may be produced.

Another inoxidation process for cast iron is the following: The cast-iron objects, such as whole gas chandeliers, water pipes, ornaments, balcony railings, cooking vessels, etc., are laid upon an iron sliding carriage 3.5 meters long and are exposed in a flame furnace of special construction first 15 minutes to the influence of gas generators with oxidizing action, then 20 minutes to such with reducing action. After being drawn out and cooled off the inoxidized pieces take on a uniform slate-blue shade of color, but can be enameled and ornamented in any manner desired. In applying the enamel the corroding with acid is obviated, for which reason the enamel stands exceedingly well.

A bronze-colored oxide coating which withstands outward influences fairly well, is produced as follows: The brightly polished and degreased objects are exposed from 2 to 5 minutes to the vapors of a heated mixture of concentrated hydrochloric acid and nitric acid (1:1) until the bronze color becomes visible on the articles. After these have been rubbed well with vaseline, heat once more until the vaseline commences to decompose. After cooling, the object is smeared well with vaseline. If vapors of a mixture of concentrated hydrochloric acid and nitric acid are allowed to act on the iron object, light reddish-brown shades are obtained, but if acetic acid is added to the above named two acids, oxide coatings of a bronze-yellow color can be obtained by the means of the vapors. By the use of different mixtures of acids any number of different colorings can be produced.

"Emaille de fer contre-oxide" is the name of an enamel which is said to protect iron pipes cheaply. The enamel is composed as follows: One hundred and thirty parts powdered crystal glass, 20.5 parts soda, 12 parts boracic acid. These substances mixed in the most careful manner are melted together in crucibles, the mass is chilled and transformed into a fine powder by crushing and grinding. The iron pipes and other objects of iron are first cleaned in the usual manner by corroding, dried and then coated with a very dilute gum arabic solution or any other gluing agent, and the powdered mass is spread over them by means of a sieve. The objects thus powdered are put in a room which is heated to 160° C. to drive out all moisture and are heated

to dark redness, at which temperature the oxide coating melts.

Those processes, which produce a black protoxide layer on the iron by heating iron objects in supersaturated aqueous vapor, have not stood the test, as the layer formed will drop off or peel off after a short time, thus opening the way for rust after all.

The anti-rust composition called rubber oil is prepared as follows, according to the specification of the patent: The crude oil obtained by the dry distillation of brown oil, peat and other earthy substances are subjected to a further distillation. Thinly rolled India rubber, cut in narrow strips, is saturated with four times the bulk of the oil and left alone for a week or so. The mass thus composed is then subjected to the action of mineral sperm oil or a similar substance, until an entirely uniform clear substance has formed. This substance, which is applied on the metallic surfaces in as thin a layer as possible, forms a sort of film after slowly drying, which is perfectly proof against atmospheric influences.

The rust-preventive composition of Jones & Co., Sheffield, is a composition of wax, fat, turpentine, and small quantities of iron oxide.

According to a process patented by A. Buchner in Germany, the iron objects are first painted with a mixture of an alkaline glue solution and rosin soap. The alkaline mass enters all the pores and fissures and prevents the rust from extending under the coating. After the first coat is dry a second one is applied of the following composition: Five parts linseed oil boiled with peroxide of manganese; 2.25 parts turpentine; 0.25 parts benzol; 20 parts zinc dust, carbonate of calcium, lead oxide, or peroxide of manganese. The mixing of the liquid with the powders must be done immediately before use, as the mass solidifies after 10 hours, and is then no longer of working consistency. The second coating, which should only be thin, hardens quickly. The paint is weatherproof, does not peel off or blister, and adheres so firmly that it can only be removed with mechanical means.

A patented process to prevent rusting of wrought or cast iron consists in applying with a brush a strong solution of potassium dichromate and drying in a stove or over an open fire. Drying at ordinary temperature is not sufficient. To ascertain if the heat is strong enough the iron is moistened with a little water. So long as this takes up any color the heat must be increased. When the proper degree of heat is reached a fine deep black layer results, which is not acted upon by water, and protects the surface from the action of the atmosphere.

A permanent lustrous rust preventive is secured as follows: The well-cleaned iron parts are suspended for a few minutes in a blue vitriol solution, so that a delicate skin of copper forms on the surface; if the pieces rinsed off with water are then moved about for a few minutes in a solution of sodium hyposulphite faintly acidulated with hydrochloric acid, they assume a blue-black coating of copper sulphide, which is equally permanent in air and in water. The black surface may be immediately rinsed with water, dried with a rag or blotting paper, and polished at once. It possesses a steel-blue luster, adheres well to the iron, will stand treatment with the scratch brush, and protects against rust in a most satisfactory manner.

Black Sheet Rust Preventive.—Before black plate is ready to receive a rust protective coating, it is necessary to render the surface free from grease and scales, for which purpose the sheet iron is placed for some time into a warmed solution of 10 parts of sulphuric acid in 100 parts of water, whereby the impurities become detached, a process which may be assisted and accelerated by scouring with sand. Then rinse in clean water and rub dry in sawdust. The sheets thus prepared are placed for a short while into a feeble solution of blue vitriol, where they assume a reddish coloring. Next, they are rinsed in water, and after that moved to and fro, for a short time, in a feeble solution of hyposulphite of soda acidulated with a little hydrochloric acid. The result is a dark-blue coating on the sheets, which prevents all oxidation.

To Keep Machinery Bright.—I.—In order to keep machinery from rusting take 1 ounce of camphor, dissolve it in 1 pound of melted lard; take off the scum, and mix as much fine black lead as will give it iron color. Clean the machinery and smear it with this mixture. After 24 hours, rub clean with soft linen cloth. It will keep clean for months under ordinary circumstances.

II.—

Mastic, transparent grains	10 parts
Camphor	5 parts
Sandarac	5 parts
Gum elemi	5 parts
Alcohol, wood, quantity sufficient to dissolve.	

Mix and cover the articles with the solution. The latter will take the lacquer better if warmed slightly, but may be easily covered in the cold, if necessary.

Magnetic Oxide.—A layer of magnetic oxide is a good preservative from rust. To obtain it the objects are placed in the furnace at a temperature sufficient for decomposing steam. Steam superheated to 1,040° F. is then injected for from 4 to 6 hours. The thickness of the layer of oxide formed varies with the duration of the operation. This process can replace zincing, enameling, and tinning.

The deposit of magnetic oxide may also be obtained by electrolysis. The iron object is placed at the anode in a bath of distilled water heated to 176° F. The cathode is a copper plate, or the vessel itself, if it is of iron or copper. By electrolysis a layer of magnetic oxide is formed. Other peroxides may be deposited in the same manner. With an alkaline solution of litharge, a very adherent, brilliant, black deposit of peroxide of lead is secured. Too energetic a current must be avoided, as it would cause a pulverulent deposit. To obtain a good coating it is necessary, after putting the objects for a moment at the positive pole, to place them at the other pole until the oxide is completely reduced, and then bring them back to their first position.

Paper as Protection for Iron and Steel.—That paraffine paper is a very good protector of iron and steel has been proven by tests conducted by Louis H. Barker for the Pennsylvania Railroad. The mode of applying the paraffine paper is as follows: After the rust is carefully cleaned off by means of stiff wire brushes, a tacky paint is applied. The paper is then covered over and tightly pressed upon the painted surface, the joints of the paper slightly lapping. As soon as the paper is in place it is ready for the outside coat of paint. Iron and steel girders and beams subjected to the action of smoke and gases may thus be admirably protected from decomposition.

Anti-Rust Paper for Needles.—This is paper covered with logwood, and prepared from a material to which fine graphite powder has been added, and which has been sized with glue and alum. It is used for wrapping around steel goods, such as sewing needles, etc., and protecting them against rust. According to Lake, the paper is treated with sulphuric acid, like vegetable parchment, the graphite being sprinkled on before the paper is put into the water.

Rust Paper.—Rust paper is produced by coating strong packing paper with linseed-oil varnish, size, or any other binder, and sprinkling on the powder given in previous formula. For use the paper must be moistened with petroleum.

Anti-Rust Pastes.—I.—This preparation serves for removing rust already present, as well as for preventing same, by greasing the article with it: Melt 5 parts of crude vaseline on the water bath, and mix with 5 parts of finely levigated powdered pumice stone into a uniform mass. To the half-way cooled mass add ½ part of crude acid oxalate of potassium (sorrel salt) in a finely powdered state and grind into complete homogeneity.

II.—Dry tallow, 25 parts; white wax, 23 parts; olive oil, 22 parts; oil of turpentine, 25 parts; mineral oil, 10 parts. Apply with a brush at the fusing temperature of the mixture.

Rust Prevention for Iron Pipes.—The pieces of pipe are coated with tar and filled with light wood sawdust, which is set afire. This method will fully protect the iron from rust for an unlimited period, rendering a subsequent coat altogether superfluous.

Rust Preventive for Tools, etc.—I.—To preserve tools, dies, etc., from rust, they should be greased well with yellow vaseline. To use oil is not advisable, since all oils, except the dear ones, which are too expensive for this purpose, contain a certain percentage of acid that has an injurious effect upon the steel and iron articles. For greasing the cavities use a hard brush.

II.—Carefully heat benzine and add half its weight of white wax, which dissolves completely in this ratio. This solution is applied to the tools by means of a brush. It is also said to protect against the action of acidiferous fumes.

III.—Take a pound of vaseline and melt with it 2 ounces of blue ointment—what druggists call one-third—and add, to give it a pleasant odor, a few drops of oil of wintergreen, cinnamon, or sassafras. When thoroughly mixed pour into a tin can—an old baking-powder can will do. Keep a rag saturated with the preventive to wipe tools that are liable to rust.

To Separate Rusty Pieces.—By boiling the objects in petroleum, success is cer-

tain. It is necessary to treat them with alcohol or spirit to avoid subsequent oxidation, petroleum being in itself an oxidant.

To Protect Zinc Roofing from Rust.—Zinc sheets for roofing can easily be protected against rust by the following simple process. Clean the plates by immersing them in water to which 5 per cent of sulphuric acid has been added, then wash with pure water, allow to dry and coat with asphalt varnish. Asphalt varnish is prepared by dissolving 1 to 2 parts asphalt in 10 parts benzine; the solution should be poured evenly over the plates, and the latter placed in an upright position to dry.

RUST SPOT REMOVER:
See Cleaning Preparations and Methods.

SACCHARINE IN FOOD:
See Food.

SADDLE GALLS:
See Veterinary Formulas.

SADDLE SOAP:
See Soap.

SALAMANDRINE DESSERT:
See Pyrotechnics.

SALICYL (SWEET):
See Dentifrices.

SALICYLIC ACID IN FOOD:
See Foods.

SALICYLIC SOAP:
See Soap.

Salts, Effervescent

Granulated effervescent salts are produced by heating mixtures of powdered citric acid, tartaric acid, sodium bicarbonate, and sugar to a certain temperature, until they assume the consistency of a paste, which is then granulated and dried.

If effervescent caffeine citrate, antipyrin, lithium citrate, etc., are to be prepared, the powder need not be dried before effecting the mixture, but if sodium phosphate, sodium sulphate, or magnesium sulphate are to be granulated, the water of crystallization must first be removed by drying, otherwise a hard, insoluble and absolutely non-granulable mass will be obtained. Sodium phosphate must lose 60 per cent of its weight in drying, sodium sulphate 56 per cent, and magnesium sulphate 23 per cent.

Naturally, water and carbonic acid escape on heating, and the loss will increase with the rise of temperature. For the production of the granulation mass it must not exceed 158° F., and for drying the grains a temperature of 122° F. is sufficient.

The fineness of the mesh should vary according to the necessary admixture of sugar and the size of the grains.

If the ingredients should have a tendency to cling to the warm bottom, an effort should be made immediately upon the commencement of the reaction to cause a new portion of the surface to come in contact with the hot walls.

When the mass is of the consistency of paste it is pressed through a wire sieve, paper or a fabric being placed underneath. Afterwards dry at sufficient heat. For wholesale manufacture, surfaces of large size are employed, which are heated by steam.

In the production of substances containing alkaloids, antipyrin, etc., care must be taken that they do not become colored. It is well, therefore, not to use heat, but to allow the mixture to stand in a moist condition for 12 hours, adding the medicinal substances afterwards and kneading the whole in a clay receptacle. After another 12 hours the mass will have become sufficiently paste-like, so that it can be granulated as above.

According to another much employed method, the mass is crushed with alcohol, then rubbed through a sieve, and dried rapidly. This process is somewhat dearer, owing to the great loss of alcohol, but presents the advantage of furnishing a better product than any other recipe.

Effervescent magnesium citrate cannot be very well made; for this reason the sulphate was used in lieu of the citrate. A part of the customary admixture of sulphate is replaced by sugar and aromatized with lemon or similar substances.

An excellent granulation mass is obtained from the following mixture by addition of alcohol:

	Parts by weight
Sodium bicarbonate	30
Tartaric acid	15
Citric acid	13
Sugar	30

The total loss of this mass through granulation amounts to from 10 to 15 per cent.

To this mass, medicinal substances, such as antipyrin, caffeine citrate, lithium citrate, lithium salicylate, phenacetin, piperacin, ferric carbonate, and pepsin may be added, as desired.

In order to produce a quinine preparation, use tincture of quinine instead of alcohol for moistening; the quinine tincture is prepared with alcohol of 96 per cent.

Basis for Effervescent Salts.—

Sodium bicarbonate, dried and powdered	53 parts
Tartaric acid, dried and powdered	28 parts
Citric acid, uneffloresced crystals	18 parts

Powder the citric acid and add the tartaric acid and sodium bicarbonate. This basis may be mixed with many of the medicaments commonly used in the form of granular effervescent salts, in the proportion which will properly represent their doses and such substances as sodium phosphate, magnesium sulphate, citrated caffeine, potassium bromide, lithium citrate, potassium citrate, and others, will produce satisfactory products. A typical formula for effervescent sodium phosphate would be as follows:

Sodium phosphate, uneffloresced crystals	500 parts
Sodium bicarbonate, dried and powdered	477 parts
Tartaric acid, dried and powdered	252 parts
Citric acid, uneffloresced crystals	162 parts

Dry the sodium phosphate on a water bath until it ceases to lose weight; after powdering the dried salt, mix it intimately with the citric acid and tartaric acid, then thoroughly incorporate the sodium bicarbonate. The mixed powders are now ready for granulation. The change in manipulation which is suggested to replace that usually followed, requires either a gas stove or a blue-flame coal-oil stove, and one of the small tin or sheet-iron ovens which are so largely used with these stoves. The stove itself will be found in almost every drug store; the oven costs from $1 to $2.

The oven is heated to about 200° F. (the use of a thermometer is desirable at first, but one will quickly learn how to regulate the flame to produce the desired temperature), and the previously mixed powders are placed on, preferably, a glass plate, which has been heated with the oven, about ½ pound being taken at a time, dependent upon the size of the oven. The door of the oven is now closed for about one minute, and, when opened, the whole mass will be found to be uniformly moist and ready to pass through a suitable sieve, the best kind and size being a tinned iron, No. 6. This moist, granular powder may then be placed upon the top of the oven, where the heat is quite sufficient to thoroughly dry the granules, and the operator may proceed immediately with the next lot of mixed powder, easily granulating 10 or more pounds within an hour.

Sugar has often been proposed as an addition to these salts, but experience has shown that the slight improvement in taste, which is sometimes questioned, does not offset the likelihood of darkening, which is apt to occur when the salt is being heated, or the change in color after it has been made several months. It should be remembered that in making a granular effervescent salt by the method which depends upon the liberation of water of crystallization, a loss in weight, amounting to about 10 per cent, will be experienced. This is due, in part, to the loss of water which is driven off, and also to a trifling loss of carbon dioxide when the powder is moistened.

EFFERVESCENT POWDERS:

Magnesian Lemonade Powder.—

Fine white sugar	2 pounds
Magnesium carbonate	6 ounces
Citric acid	4 ounces
Essence of lemon	2 drachms

Rub the essence into the dry ingredients, work well together, sift, and bottle.

Magnesian Orgeat Powder.—

Fine sugar	1 pound
Carbonate of magnesia	3 ounces
Citric acid	1 ounce
Oil of bitter almonds	3 drops
Vanilla flavoring, quantity sufficient.	

Thoroughly amalgamate the dry ingredients. Rub in the oil of almonds and sufficient essence of vanilla to give a slight flavor. Work all well together, sift, and bottle.

Raspberryade Powder.—

Fine sugar	2 pounds
Carbonate of soda	2 ounces
Tartaric acid	2 ounces
Essence of raspberry	4 drachms
Carmine coloring, quantity sufficient.	

Rub the essence well into the sugar, and mix this with the soda and acid. Then work in sufficient liquid carmine to make the powder pale red, sift through a fine sieve, and pack in air-tight bottles.

Ambrosia Powder.—

Fine sugar	2 pounds
Carbonate of soda	12 drachms
Citric acid	10 drachms
Essence of ambrosia	20 drops

Amalgamate the whole of the above, and afterwards sift and bottle in the usual manner.

Noyeau Powder.—

Fine sugar	2 pounds
Carbonate of soda	12 drachms
Tartaric acid	10 drachms
Essence of Noyeau	6 drops

After the dry ingredients have been mixed, and the essence rubbed into them, sift and bottle the powder.

Lemon Sherbet.—

Fine sugar	9 pounds
Tartaric acid	40 ounces
Carbonate of soda	36 ounces
Oil of lemon	2 drachms

Having thoroughly mixed the dry ingredients, add the lemon, rubbing it well in between the hands; then sift the whole thrice through a fine sieve, and cork down tight.

As oil of lemon is used in this recipe, the blending must be quite perfect, otherwise when the powder is put in water the oil of lemon will float.

Any other flavoring may be substituted for lemon, and the sherbet named accordingly.

Cream Soda Powder.—

Fine sugar	30 parts
Tartaric acid	7 parts
Carbonate of soda	6 parts
Finely powdered gum arabic	1 part
Vanilla flavoring, quantity sufficient.	

Proceed exactly as for lemon sherbet.

Kissingen Salt.—

Potassium chloride	17 parts
Sodium chloride	367 parts
Magnesium sulphate (dry)	59 parts
Sodium bicarbonate	107 parts

For the preparation of Kissingen water, dissolve 1.5 grams in 180 grams of water.

Vichy Salt.—

Sodium bicarbonate	846 parts
Potassium carbonate	38 parts
Magnesium sulphate (dry)	38 parts
Sodium chloride	77 parts

For making Vichy water dissolve 1 part in 200 parts of water.

Seidlitz Salt.—This is one of the many old names for magnesium sulphate. It has at various times been known as Seidlitz salt, Egra salt, canal salt, bitter salt, cathartic salt, English salt, and Epsom salt. Its earliest source was from the salt springs of Epsom in England and from this fact it took its last two names. For a long time sea-salt makers supplied the markets of the world. They procured it as a by-product in the making of salt. The bitter water that remained after the table salt had been crystallized out was found to contain it. Now it is chiefly procured from such minerals as dolomite, siliceous magnesium hydrate, and schistose rock containing the sulphide of magnesia. Many medical men deem it our best saline cathartic.

SALTS, SMELLING.

I.—Moisten coarsely powdered ammonium carbonate with a mixture of

Strong tincture of orris root	2½ ounces
Extract of violet	3 drachms
Spirit of ammonia	1 drachm

II.—Fill suitable bottles with coarsely powdered ammonium carbonate, and add to the salt as much of the following solution as it will absorb:

Oil of orris	5 minims
Oil of lavender flowers	10 minims
Extract of violet	30 minims
Stronger water of ammonia	2 ounces

SALVES:

See Ointments.

SAND:

Colored Sand.—Sift fine white sand from the coarser particles and color it as follows:

I.—Blue.—Boil 106 parts of sand and 4 of Berlin blue with a small quantity of water, stirring constantly, and dry as soon as the sand is thoroughly colored.

II.—Black Sand.—Heat very fine quartz sand, previously freed from dust by sifting, and add to every ¼ pound of it 6 to 8 spoonfuls of fat. Continue the heating as long as smoke or a flame is observed on stirring. The sand is finally washed and dried. This black sand will not rub off.

III.—Dark-Brown Sand.—Boil white sand in a decoction of brazil wood and dry it over a fire.

IV.—Rose-colored sand is obtained by mixing 100 parts of white sand with 4 parts of vermilion.

Lawn Sand.—Lawn sand may be prepared by mixing crude ammonium sulphate, 65 parts, with fine sand, 35 parts. This mixture will kill daisies and plantains, but does not permanently injure the grass of lawns. A most effective method of killing plantains is to put, during dry weather, a full teaspoonful of common salt in the head of each.

SAND HOLES IN BRASS:
See Castings.

SAND SOAP:
See Soap.

SANDSTONE CEMENTS:
See Adhesives.

SANDSTONE COATING:
See Acid-Proofing.

SANDSTONES, TO REMOVE OIL SPOTS FROM:
See Cleaning Preparations and Methods.

SAND, TO PREVENT ADHESION OF SAND TO CASTINGS:
See Castings.

SARSAPARILLA.

Each fluidounce of Ayer's sarsaparilla represents

Sarsaparilla root	10 parts
Yellow dock root	8 parts
Licorice root	8 parts
Buckthorn bark	4 parts
Burdock root	3 parts
Senna leaves	2 parts
Black cohosh root	2 parts
Stillingia root	4 parts
Poke root	1 part
Cinchona red bark	2 parts
Potassium iodide	4 parts

Solvent.—Alcohol, 10½ minims to each fluidrachm; glycerin, syrup, water.

This is the formula as given by Dr. Charles H. Stowell, of the Ayer Company, to the daily papers, for advertising purposes.

Sarsaparilla Flavoring.—

Oil wintergreen	6 parts
Oil sassafras	2 parts
Oil cassia	1½ parts
Oil clove	1½ parts
Oil anise	1½ parts
Alcohol	60 parts

Sarsaparilla Syrup.—

Simple syrup	40 ounces
Sarsaparilla flavoring	1 drachm
Caramel to color.	

SARSAPARILLA EXTRACT:
See Essences and Extracts.

SALT, USES FOR:

Brass can be readily cleaned with a solution of salt and vinegar. A saturated solution of salt in water when washing clothes will prevent colors from running. Salt should be added to water before spaghetti, potatoes or vegetables are boiled in it. A speck of salt added to cream helps in whipping. An excellent throat gargle, which is highly recommended by physicians, is salt water. To keep clothes from freezing on the line add salt to the rinsing water. Salt eaten with nuts aids digestion. Egg stains on silver can easily be removed with the use of salt. Carpets can be cleaned easily and will look brighter if salt is sprinkled on them. Rust stains can be removed by rubbing salt and lemon on them and then drying in the sun.

Saving Coal.—

Permanganate of potassium	1 pound
Common salt	20 pounds
Powdered chlorate of potassium	2 pounds
Powdered burnt umber	1 pound

Crush the permanganate small and mix with the other ingredients by sieving. This quantity is sufficient for one ton of either hard or soft coal. Dissolve in four gallons of water, and sprinkle evenly over the coal. For a hod of coal use one teaspoonful.

SCISSORS HARDENING:
See Steel.

SCOURING LIQUIDS:
See Laundry Preparations.

SCRATCH BRUSHING:
See Plating, under Gilding.

SCREWS:

To Prevent Screws from Rusting and Becoming Fast.—Screws will sometimes rust in their seats, even when carefully oiled before driving them to their seats, but if they are anointed with a mixture of graphite and soft tallow they will remain unrusted and unaltered for years.

A screw rusted in may also be removed by placing the flat extremity of a red-hot rod of iron on it for 2 or 3 minutes. When the screw is heated, it will be found to turn quite easily.

SCREWS, BLUEING:
See Steel.

SCREWS IN WATCHES:
See Watchmakers' Formulas.

SEALING (BURNING) TRICK:
See Pyrotechnics.

SEALING WAX:
See Waxes.

SEA SICKNESS.

I.—To prevent sea sickness, take 2 or 3 grams of potassium bromide dissolved in plain or carbonated water every evening either with supper or just before retiring for several weeks before going on the voyage. During the voyage, breathing should be deep and a tight bandage should be worn around the abdomen.

II.—

Menthol	0.1 part
Cocaine hydrochloride	0.2 parts
Alcohol	60.0 parts
Syrup	30.0 parts

A dessertspoonful to be taken at intervals of half an hour.

SEASONINGS:
See Condiments.

SEED, BIRD:
See Bird Foods.

SEEDS, TESTS FOR FOREIGN:
See Foods.

SEIDLITZ POWDERS:
See Salts (Effervescent).

SELTZER WATER:
See Water.

SERPENTS, PHARAOH'S.

An old form consisted of pellets of a very poisonous mercurial compound which gave off dangerous fumes when heated. The "eggs" may be made of comparatively safe material by the following formula:

Potassium bichromate.	2 parts
Potassium nitrate	1 part
White sugar	2 parts

Powder each ingredient separately, mix, and press into small paper cones. These must be kept from light and moisture.

Of course, neither this nor other chemical toys containing substances in the slightest degree harmful if swallowed should be placed in the hands of children not old enough fully to understand the danger of eating or even tasting unknown things.

SEWER GAS, HOW TO DETECT.

If you suspect sewer gas but cannot readily determine whether it is that or some other odor, here is a good test: Soak a piece of white unglazed paper in a mixture of 1 oz. of lead acetate and a ½ pt. of rain or distilled water. When the paper is thoroughly dry place it in the suspicious locality and if sewer gas is present the paper will shortly turn dark.

SHARPENING STONES:
See Whetstones.

SHAVING PASTE.

An emulsion of paraffine wax, melting at 131° F., should be used. This is prepared with 25 per cent of wax and 2 per cent of tragacanth, the wax being melted and mixed with the tragacanth previously made into a mucilage with some of the water. The addition of a little stearine or lard renders the emulsification of the wax easier, while about 10 per cent of alcohol makes the preparation more agreeable to use. The fatty odor of the preparation may be covered by the addition of ½ to 1 per cent of lavender oil, and the finished product then appears as a thick white cream. In use a small quantity is rubbed over the area to be shaved and the razor immediately applied. As the water in the emulsion evaporates, the particles of wax previously distributed in the emulsion become coherent and fill up the depressions in the surface of the skin from which the hairs arise, thus forming a mechanical support during the passage of the razor. The quantity required is very small, 1 ounce being sufficient for shaving the face about 6 times.

SHAVING SOAP:
See Soap.

SHEEP-DIPS:
See Disinfectants.

SHEEP DISEASES:
See Veterinary Formulas.

SHELL CAMEOS.

If shell cameos and corals have become too hot in cementing and cracks have appeared in consequence, olive oil is applied and allowed to soak in by heating. The same process is employed for shell cameos which have developed white fissures, owing to being filed smaller.

SHELL, IMITATION OF:
See Casein Compounds.

SHELLS, LUBRICANTS FOR RE-DRAWING:
See Lubricants.